

## ***Interactive comment on “Evaluation and application of multi-decadal visibility data for trend analysis of atmospheric haze” by C. Li et al.***

**Anonymous Referee #2**

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The paper by Li et al. analyzes the multi-decadal  $1/\text{Vis}$  changes over the US, Europe and Eastern Asia and their correlations with  $\text{SO}_2$  emissions. Building on previous works, the paper makes important efforts to ensure data consistency over the long term, which leads to important findings on the  $1/\text{vis}$  trends that are largely consistent with historical  $\text{SO}_2$  emissions. The paper is well written and could be published with minor revisions. It would be interesting to compare the  $1/\text{Vis}$  trends with satellite AOD data. For example, is the  $1/\text{Vis}$  trend in the recent decade consistent with MODIS AOD trend? The comparison would be interesting especially for regions with fewer ground-based aerosol (optical) measurements. In the abstract, please clarify ‘change point detection’. The nighttime and daytime visibility measurement methods and meanings are very different. Does the monthly  $1/\text{vis}$  calculation take into account this difference?

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Page 7, Line 20-27: How exactly to determine the changes manually? Page 8, Line 11-13: Is it possible to test the importance of change point detection for the long-term analysis, since this is a major contribution of the present study? Page 17, last paragraph: the discussion on Chinese pollution transport is relatively subjective. Could you provide more analyses or references on how Chinese pollution transport would change/reverse the pollution trend in Korea, since this has important implications for regional pollution control and collaboration? Especially in recent decades, the importance of other aerosols or precursors has increased relative to  $\text{SO}_2$ , such as  $\text{NO}_x$ ,  $\text{NH}_3$ , SOA, and BC. The paper mainly compares the  $1/\text{vis}$  trend with  $\text{SO}_2$  trend. It will be interesting to discuss if other species have affected the  $1/\text{vis}$  trends in recent years. For example, Lin et al. (2010) and Zhao et al. (2009) both showed the offset of  $\text{SO}_2$  reduction over China by rapidly increasing  $\text{NO}_x$ . Lin, J.-T. et al. Recent Changes in Particulate Air Pollution over China Observed from Space and the Ground: Effectiveness of Emission Control. *Environmental Science & Technology* 44, 7771-7776, (2010). Zhao, Y. et al. Soil Acidification in China: Is Controlling  $\text{SO}_2$  Emissions Enough? *Environmental Science & Technology* 43, 8021-8026, (2009).

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